September 27, 2022 Scope and Format of the Graduate Advancement to Candidacy Exam Boston University, Department of Physics

Purpose of the Examination:

The purpose of the ACE (Advancement to Candidacy Exam) is to assess a student's research potential and to test the student's depth and breadth of knowledge in physics.

A committee of four faculty members (the DGS plus three additional faculty members) will conduct the ACE, which will involve an oral presentation followed by questions from the committee. Interested parties, including the student's research advisor, may attend the oral presentation, but only the student and their ACE committee members can be present for the exam questioning. The Director of Graduate Studies (DGS), who may consult with the student's advisor if the student has an advisor, will appoint the ACE committee member. A student's advisor cannot serve on their student's ACE committee.

Conduct of the Examination:

Format: The examination consists of a concise oral presentation of approximately 20 minutes on a research paper chosen by the student in consultation with their research advisor, which is subject to approval by the DGS. If the student does not have an advisor at the time of ACE preparation, a student can choose a paper in their field of interest, again subject to approval by the DGS. The committee will ask questions about the content of the research paper following the presentation. Some questions will encourage the student to place the discussed paper within a broader physics context.

Duration: The entire examination should last about 60 minutes, which includes the 20 minutes for the oral presentation.

Schedule: The ACE should be held by the end of the students' *second year*, with a time table as follows: (i) select the paper/topic by February 15 of the spring semester of the second year; (ii) conduct the oral exam before the end of that spring semester or at the beginning of the following fall semester but in no case later than September 30 at the start of the students' third year.

Grading of the examination: Following the examination, the committee assigns a Pass or Fail grade and submits their assessment to the DGS. The committee must determine the P/F grade and notify the student immediately following the exam. (Ties and requests for further information are not possible outcomes.)

A **Pass** grade permits the student to advance to PhD Candidacy.

In the case of a *Fail* grade, the DGS will consider the committee's assessment and the student's other academic progress indicators to decide whether the student will be allowed a second exam attempt. If granted, the additional exam attempt must be conducted before the end of the following spring. If an additional attempt is not permitted, the student will be terminated from the program. A second ACE failure will also result in the student's termination. While students cannot appeal their ACE grade, they can appeal a termination decision to the Department Chair.

Guidelines for Faculty:

The faculty trust in the judgment of their faculty colleagues to ask reasonable questions.

The exam committee will fill out a form with a grading rubric to facilitate the discussion among its members. The proposed form is analogous to the forms already used for the Departmental Seminars and PhD Final Examinations. Comments on the assigned score in each of the areas outlined in the grading rubric must be included in the form. If the committee assigns a Fail grade, they must submit a recommendation to the DGS detailing any proposed remedial action, such as whether the student can retake the ACE or whether the student should take additional courses.

Guidelines for students:

Students should start preparing for the ACE during their second year in the PhD program and in advance of the February 15 paper selection deadline.

1. The student chooses a research paper (usually in their planned research area), as the topic of their oral exam presentation. The chosen paper is subject to approval by the DGS. If the student has a research advisor, the paper should be chosen in consultation with the advisor.

2. The student's presentation should not be about any specific research that they have conducted, which will be showcased at the Departmental Seminar, but rather on the research described in the selected paper.

- i. Selection of a research article or paper that has been published in a peer-reviewed journal within the last decade or on the arXiv is recommended. A seminal paper in the field may also be chosen. The DGS, in consultation with the committee, approves the paper. Ideally, the selected paper could be a letter or short article, or a section of a review article.
- ii. The oral presentation on the selected paper should last no more than 20 minutes. It should cover the background physics, as well as describe the results and the main

conclusion, and include a perspective on the impact of the selected article. A suggested template is provided at the end of this document.

3. At the end of the presentation, the exam committee will ask the student questions about the paper they described.

4. The exam will continue with additional questions encouraging the student to place their presentation in a broader physics context.

Suggested Template for the Oral Presentations:

For the presentation part of the ACE, students may prepare slides (including any supporting media) or a blackboard chalk talk. While the committees may accept a wide range of formats, the 20-minute time limit will be enforced. Below is a suggested outline for presentations with prepared slides. As a rule, for a 20-minute talk there should be no more than 12 slides, not counting acknowledgements and any additional references. It is good practice to include slide numbers and citations on each presentation slide. It is also prudent to rehearse the talk in front of members of the student's research group or friends and colleagues.

- 1) Title slide with student's name (1 slide)
- 2) Outline of talk and the paper to be presented (1 slide)
- 3) Motivation and background physics (1-2 slides)
- 4) Description of the main results and conclusions in the paper (no more than 6 slides)
- 5) Critique/perspective on the impact of the paper (1-2 slides)
- 6) Acknowledgement and references
- 7) Backup slides to answer anticipated questions (Optional)